



# Nondestructive Condition Monitoring for Tensioned Steel Members

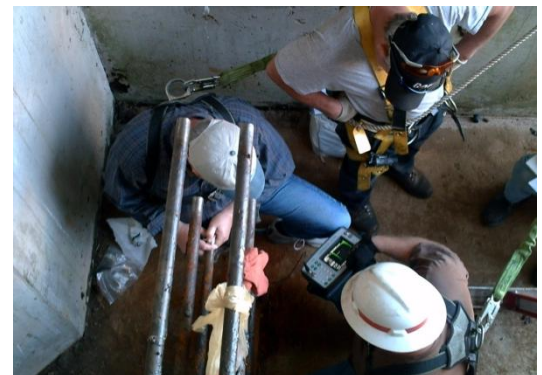
## Problem

Many Corps of Engineers navigation structures contain embedded and external steel structural members under tension and subject to corrosion and loss of tension. Two examples are tainter gates, held in place by massive steel anchors embedded in the dam, and lock gate diagonal bracing. Lock gates can experience excessive tension on this diagonal bracing. Problems with these components are hidden and difficult to evaluate. A non-destructive testing (NDT) method is needed to determine the tension and the degree of corrosion present. A method to continually monitor the tension while opening and closing gates could prevent abrupt failures of the rods. Present testing methods consist of visual inspection for corrosion, anchor length measurement or hammer testing to determine gross loss of tension, and jacking, which directly measures tension. Problems with present testing methods are accuracy, time, and access.



## Approach

This work seeks to develop a high-power acoustic measurement system for nondestructive measurement of the tension in both exposed and buried post-tensioned steel members. The design of this instrument will be based on ERDC-CERL's patent #7,614,303, "Device for Measuring Bulk Stress Via Insonification and Method of Use Therefore." The effectiveness of this new measurement system will be tested in the Engineer Research and Development Center's Anchor Rod Test Bed and on Corps-owned Civil Works structures. Also, system performance will be optimized.

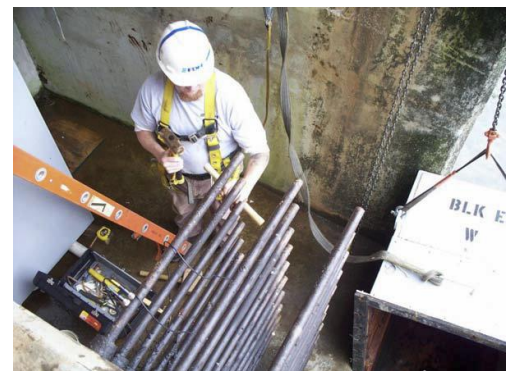


## Products

This work will provide a small, portable instrument to conduct quantitative measurements of tension in steel tainter gate anchor rods and lock gate diagonal bracing. It will work in areas with limited access. With post-processing, it will provide evaluation of fitness for service. It has been successfully demonstrated on 45-ft-long anchor rods.

## Benefits

This research will create a method that directly interrogates the mechanical and material properties of steel structural members, addresses the corrosion problem, takes little time and human resources to perform, and requires minimal access. The method will provide additional information on anchor tension for economic planning purposes or for maintenance and/or operations.



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